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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Inventor(s):
Jonathon M. Owen, Mark D. Hummel, and James B. Keller

Title: System and Method for Implementing a Separate Virtual Channel for Posted Requests in a Multiprocessor Computer System

Examiner: Ferris, Derrick W.
Group/Art Unit: 2663
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APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
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Sir/Madam:

Further to the Notice of Appeal filed September 17, 2004, Appellants present this Appeal Brief. Appellants respectfully request that this appeal be considered by the Board of Patent Appeals and Interferences.

I. REAL PARTY IN INTEREST

The present application is jointly owned by Advanced Micro Devices, Inc. and SAMSUNG Electronics. Advanced Micro Devices, Inc. is a corporation organized and existing under and by virtue of the laws of the State of Delaware, and having its principal place of business at One AMD Place, Sunnyvale, CA 94088. The interest of Advanced Micro Devices, Inc. is evidenced by the assignment recorded at Reel 011148, Frame 0061. SAMSUNG Electronics acquired Alpha Processor, Inc., whose interest in the present application is evidenced by the assignment recorded at Reel 011148, Frame 0098.

II. RELATED APPEALS AND INTERFERENCES

No other appeals, interferences or judicial proceedings are known which would be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 33-63 are pending. Claims 33-40, 42, 44-51, 53, 55-60, and 62 stand rejected. Claims 41, 42, 52, 54, 61, and 63 are objected to but would be allowable if rewritten in independent form. The rejection of claims 33-40, 42, 44-51, 53, 55-60, and 62 is being appealed. A copy of claims 33-63 is included in the Claims Appendix attached hereto.

IV. STATUS OF AMENDMENTS

No amendments to the claims have been submitted subsequent to the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 33 is directed to a method. The method includes a first node (12A-12D, 204A-204C) of a plurality of nodes in a computer system (10) transmitting a posted request packet. The plurality of nodes implement a plurality of virtual channels (40A-40B) to communicate packets between the nodes (Specification, page 19, lines 11-31). The plurality of virtual channels comprises a posted command virtual channel (table

42, Fig. 9) dedicated to posted request packets (Specification, page 21, line 28-page 22, line 7). A given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source (Specification, page 3, lines 19-21 and page 21, line 28-page 22, line 7). Transmitting the posted request packet comprises transmitting on the posted command virtual channel. The posted request packet is received in a second node of the plurality of nodes (Specification, page 20, line 26-page 21, line 8). See also the Specification, page 4, lines 18-31.

Independent claim 44 is directed to computer system (10) comprising a plurality of nodes (12A-12D, 204A-204C) including a first node and a second node coupled to the first node. The plurality of nodes implement a plurality of virtual channels (40A-40B) to communicate packets between nodes (Specification, page 19, lines 11-31), wherein the plurality of virtual channels comprise a posted command virtual channel (table 42, Fig. 9) dedicated to posted request packets (Specification, page 21, line 28-page 22, line 7). A given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source (Specification, page 3, lines 19-21 and page 21, line 28-page 22, line 7). The first node is configured to transmit a posted request packet on the posted command virtual channel, and the second node is coupled to receive the posted request packet (Specification, page 20, line 26-page 21, line 8). Independent claim 55 is directed to a node similar to the first node.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 33-35, 37-38, 44-46, 48-49, and 55-57 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Thorson, U.S. Patent No. 6,055,618 ("Thorson").

2. Claims 33-40, 42, 44-51, 53, 55-60, and 62 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Sharma, U.S. Patent No. 6,094,686 ("Sharma").

VII. ARGUMENT

First Ground of Rejection:

Claims 33-35, 37-38, 44-46, 48-49, and 55-57 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Thorson. Appellants traverse this rejection for the following reasons. Since claims 36, 39-43, 47, 50-54, and 58-63 are not rejected over Thorson, arguments regarding these claims are not presented with regard to the first ground of rejection.

Claims 33, 44, and 55:

Appellants respectfully submit that each of claims 33, 44, and 55 recite combinations of features not taught or suggested in Thorson. For example, claim 33 recites a combination of features including: "a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source, and wherein transmitting the posted request packet comprises transmitting on the posted command virtual channel".

The Final Office Action mailed June 21, 2004 in the present application (the "Final Office Action" herein) alleges that Thorson anticipates the above highlighted features. Appellants note that the Final Office Action states an allegedly reasonable interpretation of "posted request packet" in light of applicant's specification. Particularly, the Office Action states that "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" is interpreted to mean a request that does not use flow control (See Final Office Action, page 2, item 2). Appellants respectfully submit that these interpretation is unreasonable, both in light of Appellants' specification and in light of the plain meaning of the terms to one of ordinary skill in the art.

The above interpretation from the Final Office Action conflicts with Appellants' specification, and thus is not a reasonable interpretation in light of the specification.

Appellants' specification describes a plurality of virtual channels, including a posted command virtual channel with a definition of posted requests as highlighted above. Additionally, the plurality of virtual channels (including the posted command virtual channel), are flow controlled for various embodiments described in the specification. For example, the specification at page 10, lines 21-31 states that any flow control mechanism may be used, and then goes on to describe a "coupon-based" scheme in which a packet transmitter ensures that a buffer of the appropriate type (corresponding to the virtual channel of a packet to be transmitted) is available in the receiver prior to transmitting the packet. This flow control mechanism is used as an example in the rest of the specification, although other mechanisms may be used. The specification describes an info packet that is used to transmit flow control information (page 18, lines 25-27). An example of such a packet is shown in Fig. 18 and described in the specification at page 40, line 16-page 41, line 15. Note the PostCmdData and PostCmd fields in Fig. 18 and the corresponding description at page 40, line 20-22 that describes these fields as corresponding to the posted command virtual channel. Furthermore, checking for buffer availability (an example of flow control) is described in the specification at various other points (e.g. page 19, lines 15-18 and 28-31; page 36, lines 28-32; page 38, lines 5-8; and page 51, lines 26-29). Thus, interpreting the above language from claim 33 to mean that flow control is not used conflicts with the specification.

Furthermore, Appellants submit that flow control has nothing to do with whether or not a request is considered complete at the source. Flow control is related to physically controlling the transmission of the packet to the destination. Logically determining whether or not a request is considered complete has nothing to do with the physical control of the transmission of the packet to the destination using flow control. Thus, flow control is either implemented, or not implemented, independent of when the source considers the request to be complete. Accordingly, the interpretation advanced in the Final Office Action is not consistent with the plain meaning of the words to one of skill in the art (see MPEP 2111.01, for example).

The Advisory Action mailed November 12, 2004 (the "Advisory Action" herein) alleges that the flow control taught by Thorson is fundamentally different than Applicants' flow control. The Advisory Action further alleges that Thorson teaches flow control at a logical level, provided on a per-channel basis over a logical channel whereas Applicants' flow control is at a physical level (See Advisory Action, continuation sheet, lines 10-16). Appellants respectfully disagree that Thorson's flow control is fundamentally different, and that Thorson's flow control is at a logical level over a logical channel. No support in Thorson is cited to show that Thorson's flow control is fundamentally different. Thorson teaches "at least one flow controlled virtual channel includes virtual channel buffers assigned to each physical communication link to store packets containing normal traffic information to be transferred between the plurality of processing elements" (Thorson, col. 3, lines 9-13). Thorson also teaches: "Flow control of normal traffic between nodes is accomplished on a flit-by-flit basis, rather than a packet-by-packet basis, so it is possible for a packet to be partially transmitted across a link and blocked due to a shortage buffer space in a receiving processing element node" (Thorson, col. 6, lines 50-54). Clearly, Thorson's flow control is at a physical level, not logical. Furthermore, flow control is over the physical channel, not a logical one.

Even further, the Advisory Action alleges that "using flow control a target informs the source that a request is complete by sending an acknowledgement back to the source" (See Advisory Action, continuation sheet, lines 7-8). No teachings from the art are cited to support this allegation. Appellants respectfully submit that flow control only indicates whether or not a receiver (which may or may not be a target of a request) has buffer space to receive another request. This has nothing to do with whether or not any request has completed.

Still further, the Advisory Action refers to teachings related to PCI I/O transactions in Appellants' specification, and alleges that perhaps Appellants are arguing more than what is recited in the claims. Appellants respectfully disagree. Appellants are arguing only claim language, and the unreasonable interpretations given thereto in the Final Office Action. Appellants' references to the specification are merely to illustrate

why the interpretation advanced in the Final Office Action is unreasonable in light of Appellants' specification, rather than a reasonable interpretation as alleged in the Final Office Action and the Advisory Action.

Appellants respectfully submit that Thorson teaches away from the interpretation alleged by the Final Office Action. For example, Thorson teaches "A response packet typically follows the same path taken by its corresponding request packet in the non-flow controlled virtual maintenance channel." (Thorson, col. 3, lines 35-37). Thus, request packets in the non-flow controlled virtual channel have response packets. Clearly, then, requests in the maintenance channel cannot teach "wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" since the source of the request in the maintenance channel expects a response.

The rejection of claim 33 over Thorson relies on the above interpretation from the Final Office Action. Particularly, the Final Office Action alleges that Thorson anticipates the posted command virtual channel with the maintenance channel 60, stating that the maintenance channel uses no flow control as described in Thorson at col. 9, lines 1-10. However, as highlighted above, flow control has nothing to do with "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source". Appellants can find no teaching in Thorson that communications in the maintenance channel have the above recited features. Accordingly, Thorson fails to anticipate claim 33 for at least this reason.

Claim 44 recites a combination of features including: "a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source, wherein the first node is configured to transmit a posted request packet on the posted command virtual channel". The same flawed interpretation of "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the

source" discussed above and the same teachings of Thorson used in the rejection of claim 33 are used in the rejection of claim 44. Appellants respectfully submit that the teachings of Thorson do not anticipate the above highlighted features of claim 44 either.

Claim 55 recites a combination of features including: "circuitry configured to transmit a posted request packet on a posted command virtual channel of a plurality of virtual channels ... wherein the posted command virtual channel is dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source". The same flawed interpretation of "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" discussed above and the same teachings of Thorson used in the rejection of claim 33 are used in the rejection of claim 55. Appellants respectfully submit that the teachings of Thorson do not anticipate the above highlighted features of claim 55 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 33, 44, and 55 is in error and respectfully request reversal of the rejection.

Claims 34-35, 45-46, and 56-57:

Claims 34-35, 45-46, and 56-57 depend from claims 33, 44, and 55, respectively, and thus are patentable over Thorson for at least the reasons given above for claims 33, 44, and 55. Additionally, Appellants respectfully submit that each of claims 34-35, 45-46, and 56-57 recite combinations of features not taught or suggested in Thorson. For example, claim 34 recites a combination of features including: "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, the method further comprising the first node transmitting a non-posted request packet on the non-posted command virtual channel".

The Final Office Action alleges that the above highlighted features are taught in Thorson via the virtual channels 50, 52, 54, 56, and 58 in figure 5. Thorson describes these virtual channels as follows: "Two virtual channels 50 and 52 are used for the C1 virtual request network. Virtual channel 50 is a vc0 type virtual channel, and virtual channel 52 is a vc1 type virtual channel. Similarly, the response C1 virtual network comprises two virtual channels 54 and 56. Virtual channel 54 is a vc0 type virtual channel and virtual channel 56 is a vc1 type virtual channel. The third virtual channel, vc, is the adaptive NC1 virtual channel 58, which provides adaptive routing in both the request and response networks." (Thorson, col. 7, lines 19-27). Thorson further teaches the following regarding C1 and NC1 virtual channels: "The C1 virtual channels implement non-adaptive, deadlock-free routing among all nodes. The C1 virtual channels form the acyclic virtual network component of interconnect 24. The second type of virtual channel is an NC1 virtual channel. The NC1 channel implements minimal fully adaptive routing. The NC1 virtual channel forms the adaptive virtual network component of interconnect 24. The NC1 virtual channel may have cycles in its channel dependency graph, since packets route freely in the NC1 channels. If at any time a decision would be made that would deadlock in the NC1 virtual channel, then the packet must be able to jump to a C1 virtual channel. Thus, packets in the NC1 channel must always be able to route into a C1 channel." (Thorson, col. 7, lines 3-16).

Nothing in the above teachings of Thorson teaches or suggests: "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, the method further comprising the first node transmitting a non-posted request packet on the non-posted command virtual channel" as recited in claim 34. For at least these reasons, Appellants respectfully submit that claim 34 is patentable over Thorson.

Claim 45 recites a combination of features including: "the plurality of virtual

channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, wherein the first node is configured to transmit a non-posted request packet on the non-posted command virtual channel". The same teachings of Thorson highlighted above with regard to claim 34 are also alleged to teach the above highlighted combination of features of claim 45. Appellants respectfully submit that the teachings of Thorson do not anticipate the above highlighted features of claim 45 either.

Claim 56 recites a combination of features including: "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, and wherein the circuitry is configured to transmit a non-posted request packet on the non-posted command virtual channel". The same teachings of Thorson highlighted above with regard to claim 34 are also alleged to teach the above highlighted combination of features of claim 56. Appellants respectfully submit that the teachings of Thorson do not anticipate the above highlighted features of claim 56 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 34, 45, and 56 is in error and respectfully request reversal of the rejection. Claims 35, 46, and 57 depend from claims 34, 45, and 56, respectively and thus the rejection of these claims over Thorson is also in error for at least the above stated reasons.

Claims 37 and 48:

Claims 37 and 48 depend from claims 33 and 44, respectively, and thus are patentable over Thorson for at least the reasons given above for claims 33 and 44. Additionally, Appellants respectfully submit that each of claims 37 and 48 recite combinations of features not taught or suggested in Thorson. For example, claim 37

recites a combination of features including: "the second node storing the posted request packet in a first packet buffer within the second node".

The Final Office Action alleges that Thorson teaches the above highlighted features via the buffers shown in figure 5. However, as highlighted above, Thorson does not teach or suggest posted request packets as defined in claim 33. Thus, Thorson also cannot teach or suggest "the second node storing the posted request packet in a first packet buffer within the second node" as recited in claim 37.

Claim 48 recites a combination of features including: "the second node is configured to store the posted request packet in a first packet buffer within the second node". The same teachings of Thorson highlighted above with regard to claim 37 are also alleged to teach the above highlighted combination of features of claim 48. Appellants respectfully submit that the teachings of Thorson do not anticipate the above highlighted features of claim 48 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 37 and 48 is in error and respectfully request reversal of the rejection.

Claims 38 and 49:

Claims 38 and 49 depend from claims 37 and 48, respectively, and thus are patentable over Thorson for at least the reasons given above for claims 37 and 48. Additionally, Appellants respectfully submit that each of claims 38 and 49 recite combinations of features not taught or suggested in Thorson. For example, claim 38 recites a combination of features including: "the first packet buffer is dedicated to the posted command virtual channel".

The Final Office Action alleges that the above highlighted features are taught in Thorson via the maintenance buffer and the description at col. 9, lines 20-26. However, as discussed above, Thorson does not teach posted command virtual channels and thus cannot teach the above highlighted features of claim 38. Thorson teaches: "The buffers

of the virtual channels carrying normal data traffic preferably reside in RAM cells. By contrast, the buffers of virtual maintenance channel 60 are typically implemented in flip-flop registers, which are completely separate from the RAM cells used for the above described adaptive routing of the normal traffic. In this way, maintenance traffic does not destroy normal data traffic." (Thorson, col. 9, lines 20-26). These teachings do not anticipate "the first packet buffer is dedicated to the posted command virtual channel" as recited in claim 38. For at least these reasons, Appellants respectfully submit that claim 38 is patentable over Thorson.

Claim 49 recites a combination of features including: "the first packet buffer is dedicated to the posted command virtual channel". The same teachings of Thorson highlighted above with regard to claim 38 are also alleged to teach the above highlighted combination of features of claim 49. Appellants respectfully submit that the teachings of Thorson do not anticipate the above highlighted features of claim 49 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 38 and 49 is in error and respectfully request reversal of the rejection.

Second Ground of Rejection:

Claims 33-40, 42, 44-51, 53, 55-60, and 62 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Sharma. Appellants traverse this rejection for the following reasons. Since claims 41, 43, 52, 54, 61, and 63 are not rejected over Sharma, arguments regarding these claims are not presented with regard to the second ground of rejection.

Claims 33, 44, and 55:

Appellants respectfully submit that each of claims 33, 44, and 55 recite combinations of features not taught or suggested in Sharma. For example, claim 33 recites a combination of features including: "a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon

transmission of the request by the source, and wherein transmitting the posted request packet comprises transmitting on the posted command virtual channel".

The Final Office Action appears to rely on the same flawed interpretation of "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" discussed above with regard to the Thorson rejections to allege that Sharma anticipates the above highlighted features. Appellants respectfully submit that Sharma does not teach or suggest "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" when the phrase is given a reasonable interpretation.

Additionally, Sharma fails to teach or suggest "a posted command virtual channel dedicated to posted request packets". The Final Office Action notes that Sharma teaches hierarchical virtual channels QIO, Q0Vic, Q0, Q1, and Q2. However, none of these virtual channels are dedicated to posted request packets. Furthermore, Sharma fails to teach "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" as recited in claim 33.

The Final Office Action, on page 5, asserts various possible interpretations in which Sharma could allegedly read on claim 33. Appellants respectfully disagree. In a first assertion, the Final Office Action refers to the QIO channel being added to eliminate flow dependence cycles between response messages from the IO system and memory space commands from the IO system (Sharma, col. 41, lines 35-37, referring further to the definition of flow dependence at col. 40, lines 37-54). However, the elimination of flow dependence cycles has nothing to do with posted request packets, wherein "a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source" as recited in claim 33.

In a second assertion, the Final Office Action alleges "Another possible interpretation is the type of command such that other types of commands may also read on the above-limitation. For example, a read RD command or a read modify Rmod may read on the above-limitation since these requests may not require an acknowledgment" (Final Office Action, page 5, lines 9-13). Appellants respectfully submit that this assertion is vague and the alleged relationship to the claims is unintelligible. Furthermore, no teachings of Sharma are cited to substantiate the assertion. Appellants submit that nothing related to command types teaches or suggest the above highlighted features. With regard to the example of the RD and Rmod commands, Appellants note that there is no virtual channel in Sharma that is dedicated to RD or Rmod commands (see table II in col. 42, in which any channel that includes the RD or Rmod commands also includes other commands).

In a third assertion, the Final Office Action alleges that Sharma's teachings regarding dedicated queues, buffers, or paths for each channel and Sharma's teachings related to the global port always being able to transfer data are somehow related to claim 33, although the alleged relationship is quite unclear in the Final Office Action. Appellants respectfully submit that none of the cited teachings from Sharma teach or suggest "a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source, and wherein transmitting the posted request packet comprises transmitting on the posted command virtual channel".

For at least all of the above stated reasons, Appellants respectfully submit that claim 33 is patentable over Sharma.

Claim 44 recites a combination of features including: "a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source, wherein the first node is configured to transmit

a posted request packet on the posted command virtual channel". The same teachings of Sharma highlighted above with regard to claim 33 are also alleged to teach the above highlighted combination of features of claim 44. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 44 either.

Claim 55 recites a combination of features including: "circuitry configured to transmit a posted request packet on a posted command virtual channel of a plurality of virtual channels ... wherein the posted command virtual channel is dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source". The same teachings of Sharma highlighted above with regard to claim 33 are also alleged to teach the above highlighted combination of features of claim 55. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 55 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 33, 44, and 55 is in error and respectfully request reversal of the rejection.

Claims 34-36, 45-47, and 56-58:

Claims 34-36, 45-47, and 56-58 depend from claims 33, 44, and 55, respectively, and thus are patentable over Sharma for at least the reasons given above for claims 33, 44, and 55. Additionally, Appellants respectfully submit that each of claims 34-36, 45-47, and 56-58 recite combinations of features not taught or suggested in Sharma. For example, claim 34 recites a combination of features including: "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, the method further comprising the first node transmitting a non-posted request packet on the non-posted command virtual channel".

The Final Office Action alleges that the above highlighted features are taught in table II in col. 72, using Q0 and Q0Vic as examples. Appellants believe the column reference is in error, since Sharma does not include a column 72. Appellants believe the correct reference to be col. 42. However, nothing in table II teaches or suggests the above highlighted features. Table II states that Q0 carries "all memory-space requests from CPU or IOP" and that Q0Vic carries "all memory-space request from CPU or IOP that transfer data" (Sharma, col. 42, table II). Sharma also lists, in Table II, examples of Sharma's requests that are carried in Q0 and Q0Vic. Nothing in this table teaches "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, the method further comprising the first node transmitting a non-posted request packet on the non-posted command virtual channel" as recited in claim 34. For at least these reasons, Appellants respectfully submit that claim 34 is patentable over Sharma.

Claim 45 recites a combination of features including: "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, wherein the first node is configured to transmit a non-posted request packet on the non-posted command virtual channel". The same teachings of Sharma highlighted above with regard to claim 34 are also alleged to teach the above highlighted combination of features of claim 45. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 45 either.

Claim 56 recites a combination of features including: "the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, and wherein the circuitry is configured to transmit a non-posted

request packet on the non-posted command virtual channel". The same teachings of Sharma highlighted above with regard to claim 34 are also alleged to teach the above highlighted combination of features of claim 56. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 56 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 34, 45, and 56 is in error and respectfully request reversal of the rejection. Claims 35-36, 46-47, and 57-58 depend from claims 34, 45, and 56, respectively and thus the rejection of these claims over Sharma is also in error for at least the above stated reasons.

Claims 37 and 48:

Claims 37 and 48 depend from claims 33 and 44, respectively, and thus are patentable over Sharma for at least the reasons given above for claims 33 and 44. Additionally, Appellants respectfully submit that each of claims 37 and 48 recite combinations of features not taught or suggested in Sharma. For example, claim 37 recites a combination of features including: "the second node storing the posted request packet in a first packet buffer within the second node".

The Final Office Action alleges that Sharma teaches the above highlighted features via the buffers described at col. 41, lines 20-29 and col. 42, lines 60-67. However, as highlighted above, Sharma does not teach or suggest posted request packets as defined in claim 33. Thus, Sharma also cannot teach "the second node storing the posted request packet in a first packet buffer within the second node" as recited in claim 37.

Sharma teaches "As mentioned above, in the current embodiment, the maximum number of hops is three. The system thus provides three channels, which are labeled Q0, Q1, and Q2 respectively. The channels are logically independent data paths through the system interconnect. The channels may be physical or virtual (or partly physical and partly virtual). When physical, each channel has distinct queue and buffer resources

throughout the system. When virtual, the channels share queue and buffer resources subject to constraints and rules states below." (Sharma, col. 41, lines 20-29). Sharma also teaches "One implementation of virtual channels in a switch-based system involves the use of physically distinct queues, buffers or paths for each channel. Alternatively, the queues, buffers or data paths may be shared between the channels, and are thus truly `virtual`. In one embodiment of the invention, a combination of these techniques is used to make optimum use of the hardware." (Sharma, col. 42, lines 60-67). This generic description of virtual channels and sharing or not sharing buffers between them does not teach or suggest "the second node storing the posted request packet in a first packet buffer within the second node" as recited in claim 37.

Claim 48 recites a combination of features including: "the second node is configured to store the posted request packet in a first packet buffer within the second node". The same teachings of Sharma highlighted above with regard to claim 37 are also alleged to teach the above highlighted combination of features of claim 48. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 48 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 37 and 48 is in error and respectfully request reversal of the rejection.

Claims 38 and 49:

Claims 38 and 49 depend from claims 37 and 48, respectively, and thus are patentable over Sharma for at least the reasons given above for claims 37 and 48. Additionally, Appellants respectfully submit that each of claims 38 and 49 recite combinations of features not taught or suggested in Sharma. For example, claim 38 recites a combination of features including: "the first packet buffer is dedicated to the posted command virtual channel".

The Final Office Action again relies on the teachings of Sharma at col. 41, lines 20-29 and col. 42, lines 60-67. However, as highlighted above, Sharma does not teach or

suggest posted request packets and posted command virtual channels as defined in claim 33. Thus, Sharma also cannot teach "the first packet buffer is dedicated to the posted command virtual channel" as recited in claim 38. Furthermore, the teachings at col. 41, lines 20-29 and col. 42, lines 60-67 regarding virtual channels and sharing or not sharing buffers between them does not teach the above highlighted features of claim 38. For at least these reasons, Appellants respectfully submit that claim 38 is patentable over Sharma.

Claim 49 recites a combination of features including: "the first packet buffer is dedicated to the posted command virtual channel". The same teachings of Sharma highlighted above with regard to claim 38 are also alleged to teach the above highlighted combination of features of claim 49. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 49 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 38 and 49 is in error and respectfully request reversal of the rejection.

Claims 39, 50, and 59:

Claims 39, 50 and 59 depend from claims 33, 44, and 55, respectively, and thus are patentable over Sharma for at least the reasons given above for claims 33, 44, and 49. Additionally, Appellants respectfully submit that each of claims 39, 50, and 59 recite combinations of features not taught or suggested in Sharma. For example, claim 39 recites a combination of features including: "the posted request packet corresponds to a write operation, the method further comprising the first node transmitting the write data corresponding to the write operation on the posted command virtual channel".

The Final Office Action again refers to Table II in Sharma with regard to claim 39, specifically referring to the write commands in the QIO and Q0Vic channels. However, as discussed above with regard to claim 33, Sharma does not teach posted request packets and a posted command virtual channel as defined in claim 33. For similar reasons, Sharma does not teach "the posted request packet corresponds to a write

operation, the method further comprising the first node transmitting the write data corresponding to the write operation on the posted command virtual channel". Furthermore, Sharma's use of write commands as cited by the Final Office Action does not teach or suggest the posted request packet nor the posted command virtual channel.

Claim 50 recites a combination of features including: "the posted request packet corresponds to a write operation, and wherein the first node is configured to transmit the write data corresponding to the write operation on the posted command virtual channel". The same teachings of Sharma highlighted above with regard to claim 39 are also alleged to teach the above highlighted combination of features of claim 50. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 50 either.

Claim 59 recites a combination of features including: "the posted request packet corresponds to a write operation, and wherein the circuitry is configured to transmit the write data corresponding to the write operation on the posted command virtual channel". The same teachings of Sharma highlighted above with regard to claim 39 are also alleged to teach the above highlighted combination of features of claim 59. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 59 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 39, 50, and 59 is in error and respectfully request reversal of the rejection.

Claims 40, 51, and 60:

Claims 40, 51 and 60 depend from claims 33, 44, and 55, respectively, and thus are patentable over Sharma for at least the reasons given above for claims 33, 44, and 55. Additionally, Appellants respectfully submit that each of claims 40, 51, and 60 recite combinations of features not taught or suggested in Sharma. For example, claim 40 recites a combination of features including: "the first node transmitting a second packet

in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push posted request packets".

The Final Office Action alleges that the features of claim 40 are taught in Sharma at col. 28, lines 16-47. As highlighted above with regard to claim 33, Sharma does not teach posted request packets. Accordingly, Sharma cannot teach "the first node transmitting a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push *posted request packets*". With regard to col. 28, lines 16-47 and the teachings regarding pushing, Sharma teaches "In the diagram of FIG. 16A, an arrow directed from one channel to another indicates that the packets in the first channel may not be forwarded to an output port while there is a packet in the second channel, received prior to the packet in the first channel, pending processing by the switch. For example, in FIG. 16A, packets in channel Q0 are shown to be dependent upon the processing of packets in channel Q3 and thus it is said that packets in channel Q0 `pushed` packets in channel Q3." (Sharma, col. 28, lines 16-24). This general discussion of packets pushing other packets does not teach "the first node transmitting a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push *posted request packets*" as recited in claim 40.

Claim 51 recites a combination of features including: "the first node is configured to transmit a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push posted request packets". The same teachings of Sharma highlighted above with regard to claim 40 are also alleged to teach the above highlighted combination of features of claim 51. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 51 either.

Claim 60 recites a combination of features including: "the circuitry is configured to transmit a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push posted

request packets". The same teachings of Sharma highlighted above with regard to claim 40 are also alleged to teach the above highlighted combination of features of claim 60. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 60 either.

For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 40, 51, and 60 is in error and respectfully request reversal of the rejection.

Claims 42, 53, and 62:

Claims 42, 53 and 62 depend from claims 40, 51, and 60, respectively, and thus are patentable over Sharma for at least the reasons given above for claims 40, 51, and 60. Additionally, Appellants respectfully submit that each of claims 42, 53, and 62 recite combinations of features not taught or suggested in Sharma. For example, claim 42 recites a combination of features including: "the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted requests".

As highlighted above with regard to claim 33, Sharma does not teach posted requests. Accordingly, Sharma cannot teach "the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted requests". The Final Office Action also refers to a dependency flag in col. 29, lines 1-20. With regard to a dependency flag, Sharma teaches: "in addition to asserting the bit indicating the channel of the entry, a bit is additionally asserted for each of the channels that the packet on that channel pushes. Each of these bits is referred to as a dependency flag, and are indicated by an `x` in FIG. 16. Therefore, for packet2, which is a Q0 channel packet, the bit associated with the Q3 channel packet is additionally asserted since, as indicated in the flow diagram of FIG. 16A, Q0 packets push Q3 packets." (Sharma, col. 29, lines 13-20). The dependency flag does not teach "the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted

requests". For at least these reasons, Appellants submit that claim 42 is patentable over Sharma.

Claim 53 recites a combination of features including: "the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted requests". The same teachings of Sharma highlighted above with regard to claim 42 are also alleged to teach the above highlighted combination of features of claim 53. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 53 either.

Claim 62 recites a combination of features including: "the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted requests". The same teachings of Sharma highlighted above with regard to claim 42 are also alleged to teach the above highlighted combination of features of claim 62. Appellants respectfully submit that the teachings of Sharma do not anticipate the above highlighted features of claim 62 either.

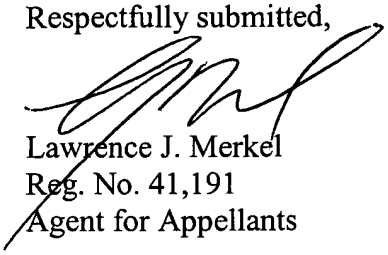
For at least the above stated reasons, Appellants respectfully submit that the rejection of claims 42, 53, and 62 is in error and respectfully request reversal of the rejection.

VIII. CONCLUSION

For the foregoing reasons, it is submitted that the Examiner's rejection of claims 33-40, 42, 44-51, 53, 55-60, and 62 was erroneous, and reversal of the decision is respectfully requested.

The Commissioner is authorized to charge the appeal brief fee of $340.00 and any other fees that may be due to Meyertons, Hood, Kivlin, Kowert, & Goetzel, P.C. Deposit Account No. 501505/5500-98400/LJM. This Appeal Brief is submitted with a return receipt postcard.

Respectfully submitted,



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Date: November 16, 2004

IX. CLAIMS APPENDIX

The claims on appeal are as follows.

33. A method comprising:

a first node of a plurality of nodes in a computer system transmitting a posted request packet, the plurality of nodes implementing a plurality of virtual channels to communicate packets between the nodes, wherein the plurality of virtual channels comprises a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source, and wherein transmitting the posted request packet comprises transmitting on the posted command virtual channel; and

receiving the posted request packet in a second node of the plurality of nodes.

34. The method as recited in claim 33 wherein the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, the method further comprising the first node transmitting a non-posted request packet on the non-posted command virtual channel.

35. The method as recited in claim 34 wherein the plurality of virtual channels further comprises a response virtual channel to communicate response packets, wherein the method further comprises the first node transmitting a response packet on the response virtual channel.

36. The method as recited in claim 35 wherein the plurality of virtual channels further comprises a probe virtual channel, the method further comprising the first node transmitting a probe packet on the probe virtual channel.

37. The method as recited in claim 33 further comprising the second node storing the posted request packet in a first packet buffer within the second node.

38. The method as recited in claim 37 wherein the first packet buffer is dedicated to the posted command virtual channel.

39. The method as recited in claim 33 wherein the posted request packet corresponds to a write operation, the method further comprising the first node transmitting the write data corresponding to the write operation on the posted command virtual channel.

40. The method as recited in claim 33 further comprising:

the first node transmitting a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push posted request packets; and

the second node processing the posted request packet prior to the second packet responsive to the second packet being defined to push the posted request packet.

41. The method as recited in claim 40 wherein the second packet includes a sequence identification number, and wherein the posted request packet also includes a sequence identification number, and wherein the second packet is defined to push the posted request packet if the sequence identification numbers are equal and non-zero.

42. The method as recited in claim 40 wherein the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted

requests, and wherein the second packet is defined to push the posted request packet if the pass posted indication is in a state indicating that the second packet is not permitted to pass posted requests.

43. The method as recited in claim 40 wherein the second packet includes a flush command.

44. A computer system comprising a plurality of nodes including a first node and a second node coupled to the first node, wherein the plurality of nodes implement a plurality of virtual channels to communicate packets between nodes, and wherein the plurality of virtual channels comprises a posted command virtual channel dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source, wherein the first node is configured to transmit a posted request packet on the posted command virtual channel, and wherein the second node is coupled to receive the posted request packet.

45. The computer system as recited in claim 44 wherein the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, wherein the first node is configured to transmit a non-posted request packet on the non-posted command virtual channel.

46. The computer system as recited in claim 45 wherein the plurality of virtual channels further comprises a response virtual channel to communicate response packets, and wherein the first node is configured to transmit a response packet on the response virtual channel.

47. The computer system as recited in claim 46 wherein the plurality of virtual channels further comprises a probe virtual channel, and wherein the first node is configured to transmit a probe packet on the probe virtual channel.

48. The computer system as recited in claim 44 wherein the second node is configured to store the posted request packet in a first packet buffer within the second node.

49. The computer system as recited in claim 48 wherein the first packet buffer is dedicated to the posted command virtual channel.

50. The computer system as recited in claim 44 wherein the posted request packet corresponds to a write operation, and wherein the first node is configured to transmit the write data corresponding to the write operation on the posted command virtual channel.

51. The computer system as recited in claim 44 wherein the first node is configured to transmit a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push posted request packets, and wherein the second node is configured to process the posted request packet prior to the second packet responsive to the second packet being defined to push the posted request packet.

52. The computer system as recited in claim 51 wherein the second packet includes a sequence identification number, and wherein the posted request packet also includes a sequence identification number, and wherein the second packet is defined to push the posted request packet if the sequence identification numbers are equal and non-zero.

53. The computer system as recited in claim 51 wherein the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted requests, and wherein the second packet is defined to push the posted request packet if the pass posted indication is in a state indicating that the second packet is not permitted to pass posted requests.

54. The computer system as recited in claim 51 wherein the second packet includes a flush command.

55. A node for a computer system, the node comprising circuitry configured to transmit a posted request packet on a posted command virtual channel of a plurality of virtual channels implemented by the node to communicate with other nodes, wherein the posted command virtual channel is dedicated to posted request packets, and wherein a given posted request packet communicates a request that is considered completed by a source of the request upon transmission of the request by the source.

56. The node as recited in claim 55 wherein the plurality of virtual channels further comprises a non-posted command virtual channel dedicated to non-posted request packets, wherein a given non-posted request packet communicates a request that is not completed by the source of the request until the request is completed at a target of the request, and wherein the circuitry is configured to transmit a non-posted request packet on the non-posted command virtual channel.

57. The node as recited in claim 56 wherein the plurality of virtual channels further comprises a response virtual channel to communicate response packets, and wherein the circuitry is configured to transmit a response packet on the response virtual channel.

58. The node as recited in claim 57 wherein the plurality of virtual channels further comprises a probe virtual channel, and wherein the circuitry is configured to transmit a probe packet on the probe virtual channel.

59. The node as recited in claim 55 wherein the posted request packet corresponds to a write operation, and wherein the circuitry is configured to transmit the write data corresponding to the write operation on the posted command virtual channel.

60. The node as recited in claim 55 wherein the circuitry is configured to transmit a second packet in one of the plurality of virtual channels other than the posted command virtual channel, wherein the second packet is defined to push posted request packets, and wherein the posted request packet is processed prior to the second packet responsive to the second packet being defined to push the posted request packet.

61. The node as recited in claim 60 wherein the second packet includes a sequence identification number, and wherein the posted request packet also includes a sequence identification number, and wherein the second packet is defined to push the posted request packet if the sequence identification numbers are equal and non-zero.

62. The node as recited in claim 60 wherein the second packet includes a pass posted indication indicating whether or not the second packet is permitted to pass posted requests, and wherein the second packet is defined to push the posted request packet if the pass posted indication is in a state indicating that the second packet is not permitted to pass posted requests.

63. The node as recited in claim 60 wherein the second packet includes a flush command.

X. EVIDENCE APPENDIX

No evidence submitted under 37 CFR §§ 1.130, 1.131 or 1.132 or otherwise entered by the Examiner is relied upon in this appeal.

XI. RELATED PROCEEDINGS APPENDIX

There are no related proceedings.